Mathematics Review ?

GySgt Hill
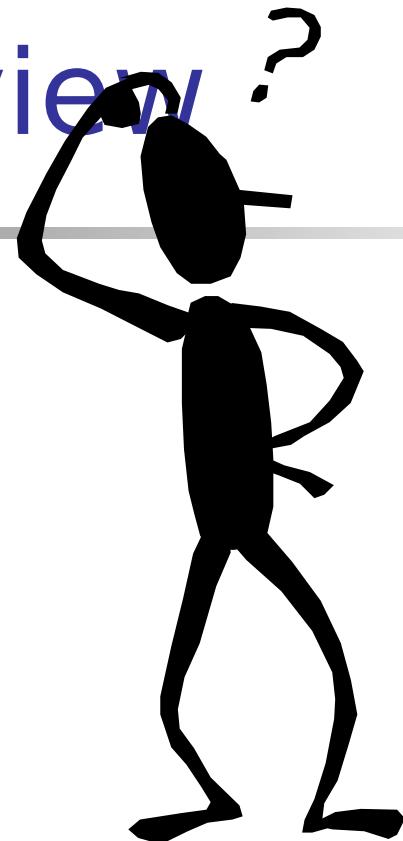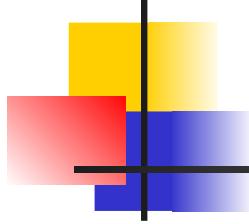
Mathematics Review

- Overview
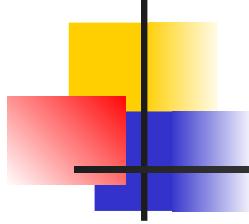
Learning Objectives

- Terminal Learning Objectives

- Enabling Learning Objectives
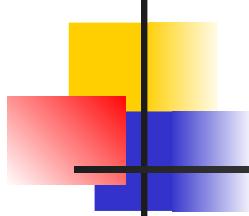
Method / Media

- Lecture Method
- Power Point Presentation
- Demonstrations
- Practical Applications / Worksheets
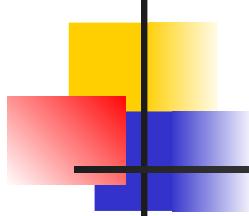
Evaluation

- Written Exam
- 70 Mathematical problems
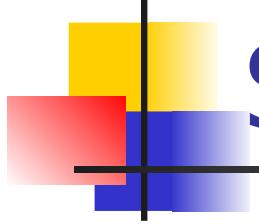
Safety / Cease Training

- Fire exit plan
- Inclement weather plan
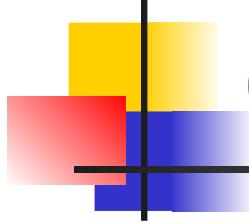
Questions

- Are there any questions
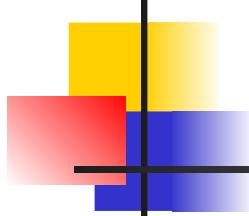
Mathematics Review

- Basic Math
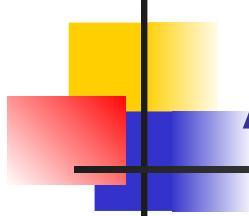
Addition

$$5 + 4 = 9$$

- The process of uniting two or more numbers into one sum.
  - Addends
  - Sum
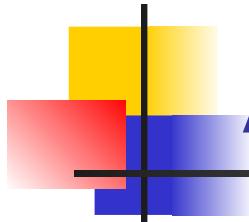
Addition

- Examples:

- 7
- 6 } Addends
- + 1
- 14 → Sum

   Addends   Sum
- 125 + 57 + 872 + 2,793 = 3,847
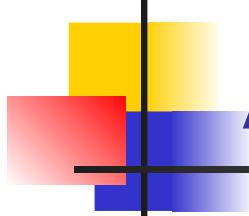
Addition Problems

- Work out the addition problems using the adding machine.
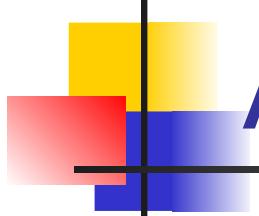
Addition Solutions

- 81   346   45   3,720   51,084   3,817
- +15   +252   +42   +4,256   +27,505   +4,162
- 96   598   87   7,976   78,589   7,979

- 946   415   723   302   729   655
- + 32   + 61   + 75   + 83   + 50   + 43
- 978   476   798   385   779
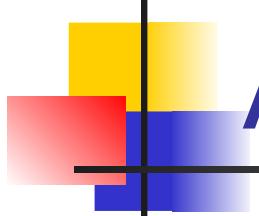
Addition Solutions

518   78   7,360   93 + 55 + 34 = 182

782   12   4,108

762   +490   +7,068   7 + 24 + 806 + 63 =

900

202   580   18,536

+843

3,107
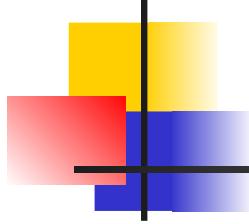
Mathematics Review

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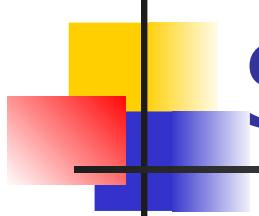
Subtraction

5 - 4 = 1

- The operation or process of finding the differences between two numbers or quantities.
  - Minuend
  - Subtrahend
 - Remainder (Difference)
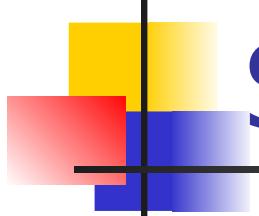
Subtraction

- Examples:

$$7 \quad \text{Minuend}$$

$$- \underline{\quad 6 \quad} \text{Subtrahend}$$

$$1 \quad \text{Remainder}$$

Minuend	Subtrahend		Remainder
525	- 25	=	500
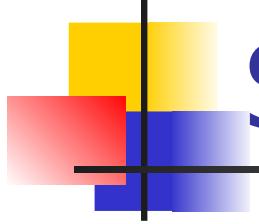
Subtraction Problems

- Work out the subtraction problems using the adding machine

Subtraction Solutions

34	69	38	52	75	81
- 22	- 35	- 31	- 32	- 51	- 40
12	34	7	20	24	41

364	751	523	952	540	686
- 263	- 401	- 231	- 940	- 230	- 251
101	350	292	12	310	435

Subtraction Solutions

896	692	546	695	588	482
- 88	- 85	- 37	- 88	- 79	- 75
808	607	509	607	509	407

4,080 - 493 = 3,587   6,070 - 576 = 5,494

2,050 - 288 = 1,762   8,004 - 483 = 7,521

40,003 - 927 = 39,076   9,002 - 605 = 8,397
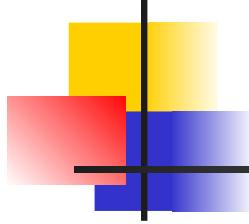
Mathematics Review

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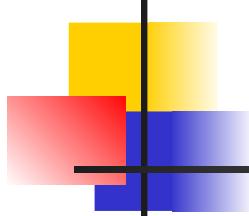
Multiplication

5 x 4 = 20

- A mathematical operation signifying, when **A** and **B** are positive integers, that **A** is to be added to itself as many times as there are units in **B.**
  - Multiplicand
  - Multiplier
  - Product
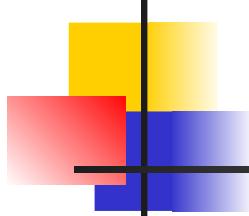
Multiplication

- Examples:

$$7 \quad \text{Multiplicand}$$
$$\underline{\times\ 6} \quad \text{Multiplier}$$
$$42 \quad \text{Product}$$

Multiplicand	Multiplier	Product
27	x 10	= 270
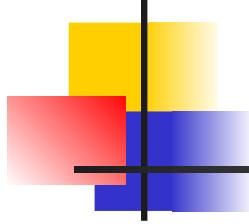
Multiplication Problems

- Work out the multiplication problems using the calculator.
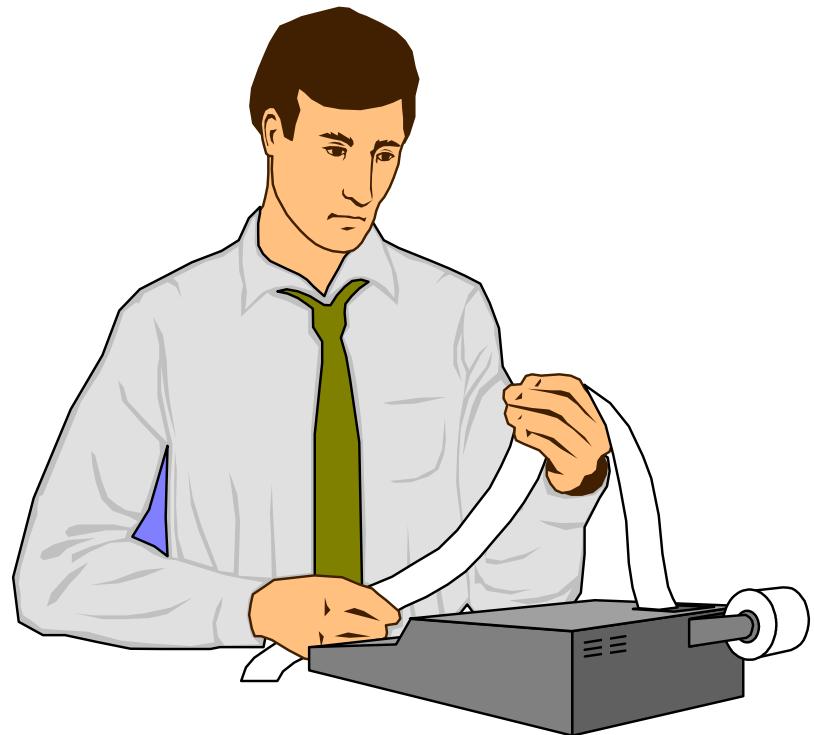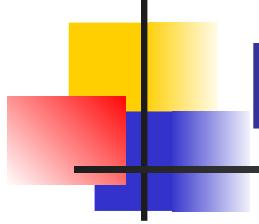
Multiplication Solutions

8 x 4 = 32   7 x 8 = 56   3 x 7 = 21   28 x 35 = 980

32,021 x 231 = 7,396,851   80, 011 x 497 = 39,765,467

50,112 x 314 = 15,735,168   10,220 x 123 = 1,257,060

71,011 x 856 = 60,785,416   82,159 x 792 = 65,069,928
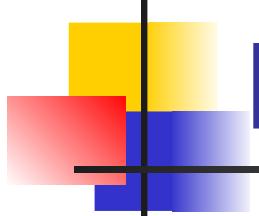
Multiplication Solutions

401 601	312	821	611	502	
x 6	x 4	x 7	x 9	x 4	x 8
2,406 4,808	1,248	5,747	5,499	2,008	

110 581	178	125	532	987	
x78	x65	x20	x11	x29	x43
8,580 24,983	11,570	2,500	5,852	28,623	
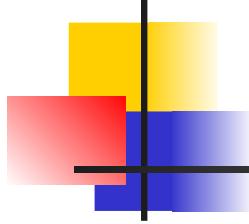
Mathematics Review

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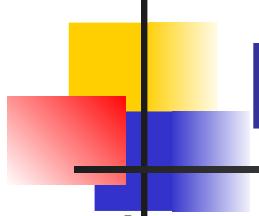
Division

- The operation of determining the number of times a number goes into another.
  - Divisor
  - Dividend
  - Quotient

$$10 / 5 = 2$$
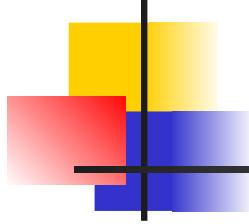
Division

- Examples:

$$\underline{6}\text{Quotient}$$

Divisor 6) 36   Dividend

Dividend   Divisor   Quotient

36 ¸ 6   =   6

36 / 6   =   6
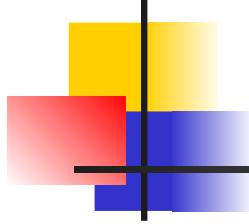
Division Problems

- Work the division problems using the calculator.
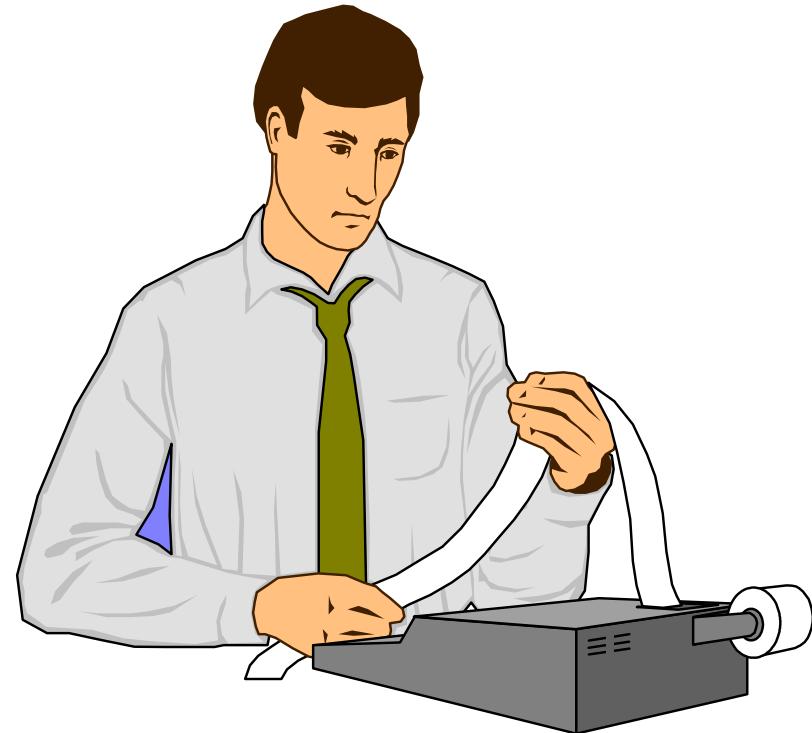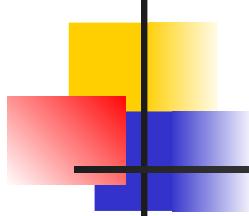
Mathematics Review

27 ÷ 9 = 3   54 ÷ 6 = 9   15 ÷ 5 = 3   18 ÷ 3 = 6

518 / 74 = 7   260 / 52 = 5   456 / 38 = 12 164 / 41 = 4

 _54_   _89   63   84   2,727
19,633
3)162   9)801   2)126   6)504   8)21,816
  5)98,165

        15,547   6,426
     4)62,188   7)44,982
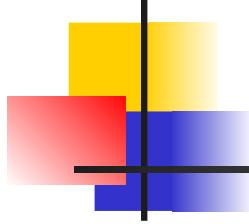
Mathematics Review

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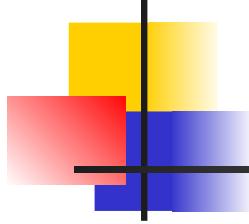
Fractions

- A part of any object, quantity, or digit.
  - Numerator
  - Denominator
  - Fraction Line

1

2
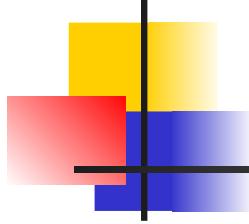
Fractions

- Types - There are three types of fractions.
  - Proper Fraction - A fraction in which the numerator is smaller than the denominator.

$$\frac{7}{13}$$
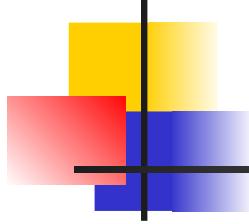
Fractions

- Improper Fraction - A fraction in which the numerator is larger or equal to the denominator.

$$\frac{14}{6} \qquad \frac{3}{3}$$
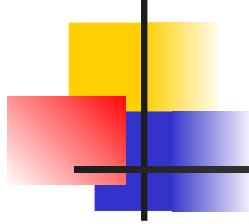
Fractions

- **Mixed number Fraction** - A fraction which contains both a whole number, and a fraction.

$$1\frac{2}{7}$$
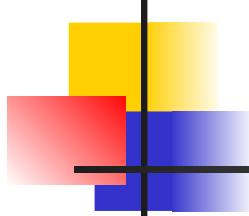
Fractions

- **Changing Mixed Number Fractions to Improper Fractions** - This can be done by using the following steps:
  - Multiply the whole number by the denominator of the fraction.
  - Add the product to the numerator.
  - Place the sum over the denominator of the

$$1\frac{2}{7} = \frac{(2 \times 7) + 1}{7} = \frac{15}{7}$$
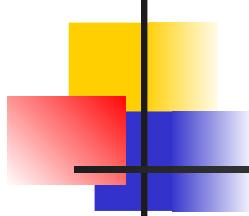
Fractions

- **Changing Improper Fractions to Mixed number Fractions** - This can be done by using the following steps:
  - Divide the denominator into the numerator, the quotient is the whole number.
  - Place the remainder

$$7\frac{1}{3}$$

$$3\overline{)7\frac{1}{}} = $$

$$2$$

$$5\ \frac{}{3}$$
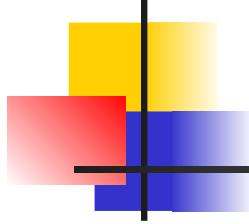
Fractions

- **Reducing Fractions**
  - This is done by dividing the numerator, and the denominator, by the same number.

$$\frac{2}{4}$$

$$\frac{2 \div 2}{4 \div 2} = \frac{1}{2}$$
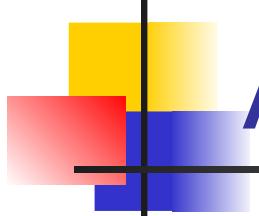
Addition Of Fractions

- Fractions with common denominators are added by doing the following:
  - Add the numerators.
  - Keep common denominator.

$$\frac{1}{2} + \frac{5}{2} + \frac{3}{2} = \frac{9}{2} = 4\frac{1}{2}$$
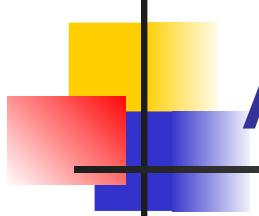
Addition Of Fractions

- Fractions with unlike denominators are added doing the following procedures:
  - Change the fractions to fractions with common denominators.
  - Add the numerators.
  - Keep the common denominator.

$$\begin{aligned}
\tfrac{1}{2} &= 4/8 \\
\tfrac{3}{4} &= 6/8 \\
+\ 2/8 &= 2/8 \\
\hline
12/8 &= \\
& 1\ \tfrac{1}{2}
\end{aligned}$$
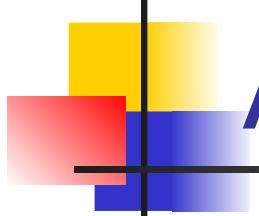
Addition Of Fractions

- Mixed Number Fractions may be added in the following manner:
  - Change fractions to fractions with common denominators.
  - Add fractions.
 - Add whole numbers.
  - If fraction is

$$2 \frac{2}{3} \quad = \quad 2 \frac{4}{6}$$

$$+4 \frac{5}{6} \qquad = \quad + 4 \frac{5}{6}$$

$$6 \frac{9}{6} = 7 \frac{1}{6}$$
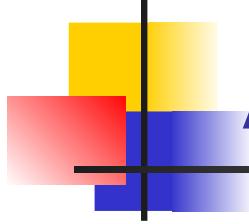
Addition Of Fractions

- Do the problems in you handout.
- Reduce to lowest terms.
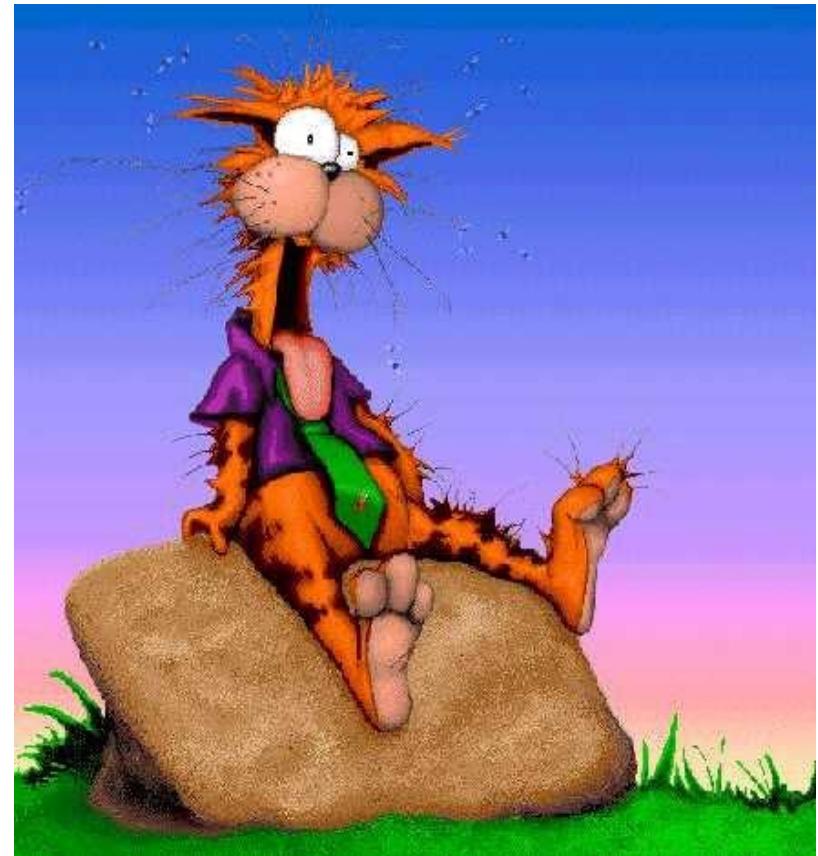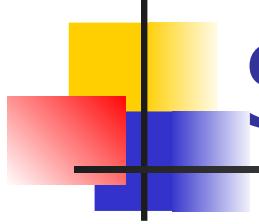
Solutions

1 a) 5/9   b) 4/7   c) 7/8   d) 7/12   e) 10/13

2 a) 6/11   b) 8/9   c) 13/15   d) 1-4/17   e) 16/19

3 a) 7-3/5   b) 14-9/10   c) 9-9/11   d) 14-11/13
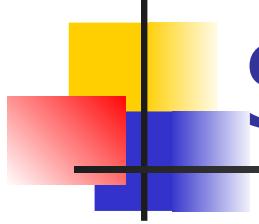
Solutions

4 a) 1-1/4 b) 1-1/2 c) 1-5/8 d) 1-1/6 e) 1-2/9

5 a) 1-5/8 b) 1-1/3 c) 2-3/10   d) 1-1/3 e) 1-1/5

6 a) 22-29/55 b) 14-1/6   c) 15-1/8   d) 22-1/6
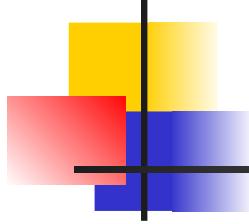
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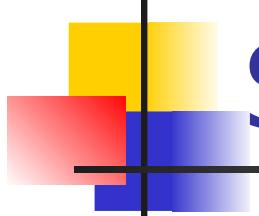
Subtracting Fractions

- To subtract fractions with common denominators, use the following steps:
  - Subtract the numerators.
  - Keep the common

$$\frac{5}{8}$$

$$-\frac{3}{8}$$

$$\frac{2}{8} = \frac{-1}{4}$$
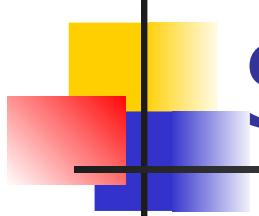
Subtracting Fractions

- To subtract fractions, having unlike denominators, use the following steps:
  - Change fractions to common denominator.
  - Subtract the numerators.
  - Keep the common denominator.

$$\frac{3}{4} - \frac{3}{8} = \frac{6}{8} - \frac{3}{8} = \frac{3}{8}$$
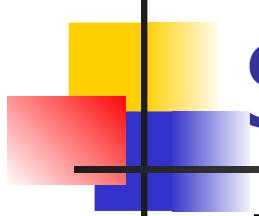
Subtracting Fractions

- To subtract mixed number fractions, use the following steps:
  - Change fractions to lowest common denominators.
  - Subject fractions.
  - If subtrahend fraction is larger than minuend fraction, borrow

$$7 \frac{1}{5} = 7 \frac{2}{10} = 6 \frac{12}{10}$$

$$- \quad 4 \frac{1}{2} = 4 \frac{5}{10} = 4 \frac{5}{10}$$

$$2 \frac{7}{10}$$
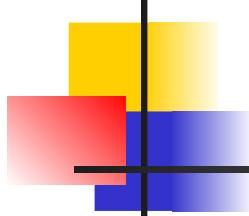
Subtracting Fractions

- Do the practice problems in your student handout.
- Subtract and reduce.
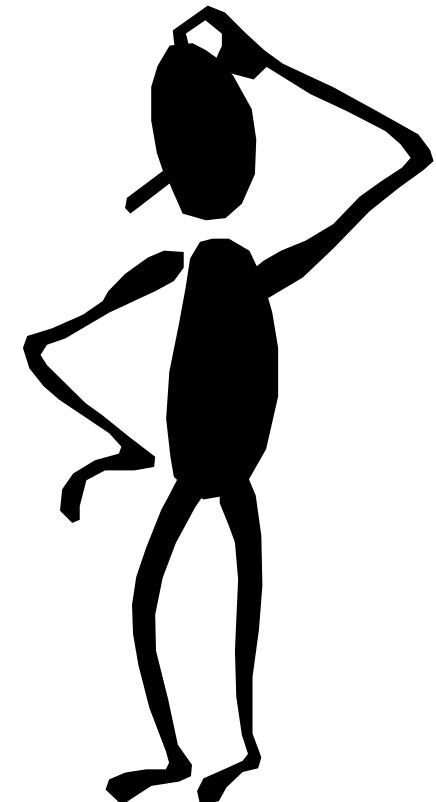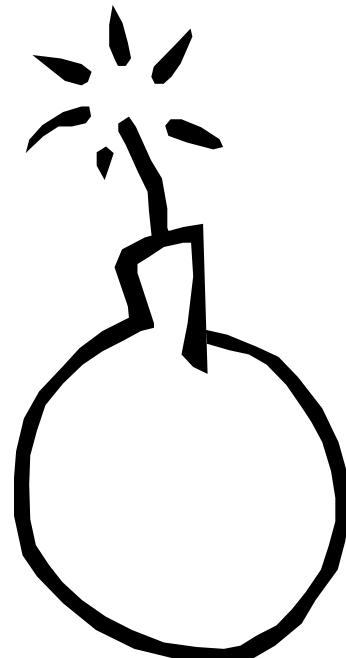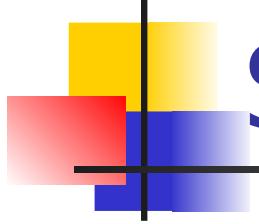
Solutions

1a) 1/3 b) 1/10 c) 1/2   d) 3/13 e) 6/11

2a) 1/3 b) 9/16 c) 1/2   d) 3/19 e) 1/5

3a) 3-4/7 b) 6   c) 1-1/3 d) 4-2/5
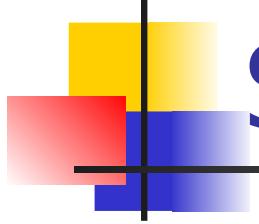
Solutions

4 a) 1/4   b) 3/8   c) 1/2   d) 9/16

5 a) 6-13/24 b) 6-3/14   c) 7-26/45 d) 3-1/20

6 a) 10-17/30 b) 6-7/8 c) 13-5/6   d) 17/22
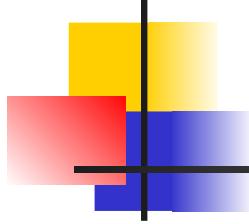
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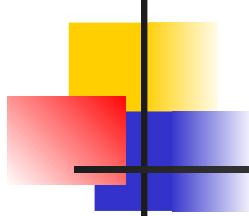
Multiplication of Fractions

- **Common fractions may be multiplied by using two methods.**

  - Multiplication Method - Multiply the numerators, then multiply

$$\frac{2}{3} \times \frac{1}{3} = \frac{2}{9}$$

$$\frac{1}{2} \times \frac{4}{1} = \frac{4}{2} = 2$$
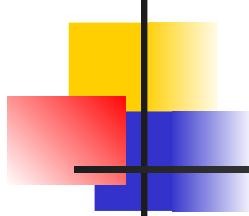
Multiplication Of Fractions

- Cancellation Method - Numbers in the numerator may be canceled by numbers in the denominators.

$$\frac{2}{3} \times \frac{3}{4} \times \frac{8}{9} =$$

$$\frac{2}{3} \times \frac{3}{4} \times \frac{8}{9}$$

$$= \frac{4}{}$$
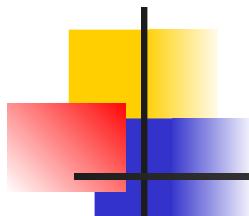
Multiplication Of Fractions

- **Mixed fractions**
  - Are multiplied by first changing the fraction to an improper fraction, then multiplying as before.

$$3\frac{1}{3} \quad x \quad 4\frac{1}{5}$$

$$= \frac{10}{3}\frac{2}{1} \quad x \quad \frac{21}{5}\frac{7}{1}$$

$$= \frac{14}{}$$
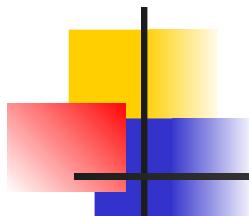
Multiplication Of Fractions

- Do the practice problems in your student handout.
- Multiply and reduce.
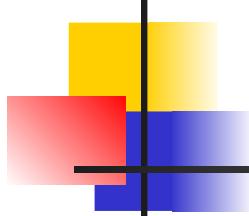
Solutions

1a) 8/15   b) 10/63   c) 7/80   d) 15/88

2a) 14/45   b) 21/64   c) 5/36   d) 16/81

3a) 9/40   b) 5/6   c) 10/81

4a) 16/75   b) 14/135   c) 8/63
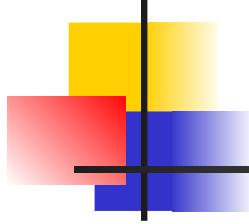
Solutions

5a) 3/10   b) 4/21 c) 7/16 d) 5/14

6a) 1/6 b) 3/8   c) 1/4   d) 3/4

7a) 4/45   b) 2/9   c) 36/625
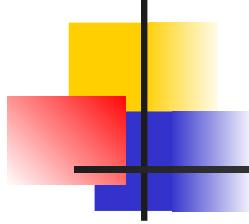
Mathematics Review

- Questions
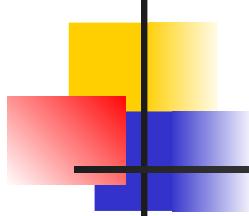
Division Of Fractions

- Division of Fractions
  - Common Fractions - May be divided by first changing the fraction to an improper fraction, then proceed as in

$$\underline{1} \qquad \underline{1} \qquad \underline{1} \qquad \underline{4} \qquad \underline{4}$$
$$2 \div 4 = 2 \times 1 = 2$$
$$= 2$$
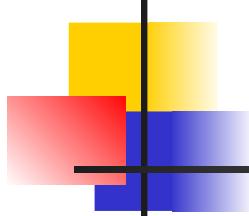
Division Of Fractions

- **Mixed Number Fractions** - May be divided by first changing the fraction to an improper fraction, then proceed as before.

$$3\frac{1}{3} \div 2\frac{1}{4}$$

$$= \frac{10}{3} \div \frac{9}{4}$$

$$= \frac{10}{3} \times \frac{4}{9}$$

$$=$$
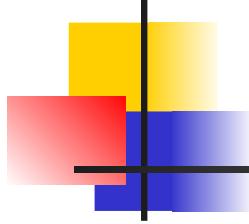
Division Of Fractions

- Do the practice problems in your student handout.
- Divide and reduce.
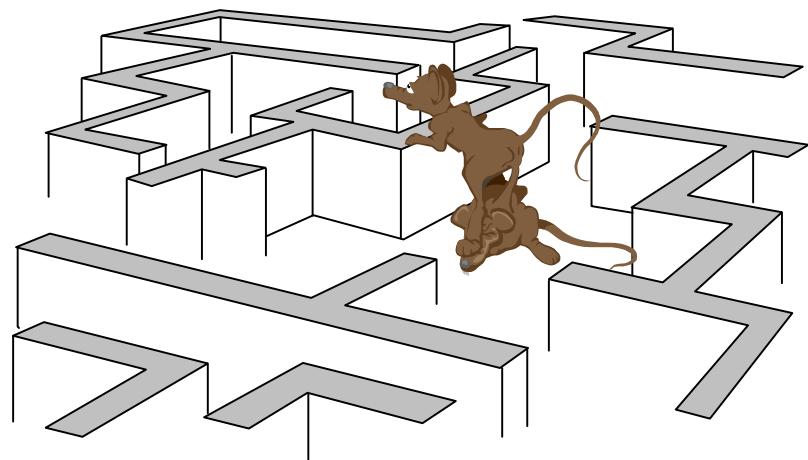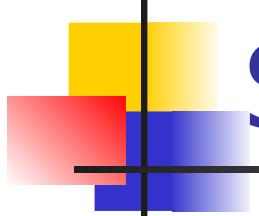
Solutions

1a) 1-1/14 b) 2/3   c) 11/24 d) 7/12

2a) 30 b) 47-1/2   c) 16-1/2   d) 13-1/3

3a) 1/15   b) 1/39 c) 3/88

4a) 2   b) 2-1/2 c) 1-13/20 d) 19-1/2

5a) 2-11/32   b) 1-221/387   c) 1-29/41 d) 4-13/18
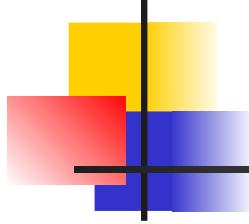
Mathematics Review

- Questions
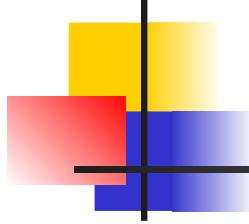
Decimals

- Decimals
  - The representation of the fraction whose denominator is some power of ten.

5.5
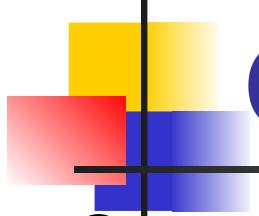
Converting Decimals

- Converting decimals to fractions can be accomplished by using the following steps:
  - Count the number of digits to the right of the decimal point, then insert the number, less the decimal point, as the numerator.
  - Put the number (1) plus a zero for each digit to the right of the decimal for the denominator.

.7 = 7/10

.241 = 241/1000
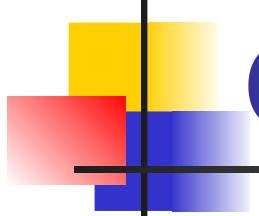
Converting Fractions

- Converting fractions to decimals can be done by dividing the denominator into the numerator.

$$
\begin{array}{r}
.25 \\
1/4 = 4\overline{)1.00} \\
\underline{8} \\
20 \\
\underline{20} \\
0
\end{array}
$$
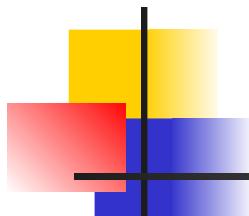
Adding & Subtracting Decimals

- To add or subtract decimals, line up the decimal point and add or subtract as with whole numbers.

- Examples:

$$
\begin{array}{r}
1.234 \\
2.86 \\
+\ \ 3.630 \\
\hline
1.70 \\
4.864 \\
1.16
\end{array}
\qquad -
$$
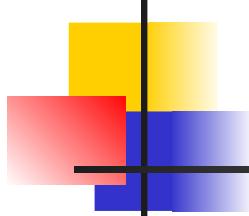
Multiplying Decimals

- Align all numbers in the problem to the right, not to the decimal, and multiply the same as with whole numbers.

- Example:

$$1.234 \leftarrow 3$$
places $\leftarrow$

$$\underline{x \quad 3.6} \quad 1$$
place

$$7404 \leftarrow$$

$$\underline{37020}$$

$$4.4424 \quad 4$$
places
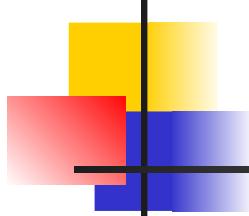
Dividing Decimals

- Move the decimal in the divisor to the right making it a whole number, do the same for the dividend and align the decimal in the answer with the decimal in the dividend

- Example:

$16.9 \div 6.5 =$

$6.5.\overline{)\,16.9.}\quad =$

$$
\begin{array}{r}
2.6 \\
65)\overline{169.0} \\
-\,130 \\
\hline
390 \\
-\ \ 390 \\
\hline
0
\end{array}
$$
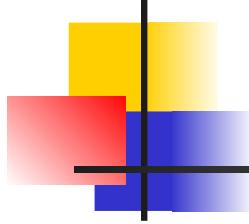
Practice Problems

- Do the practice problems in your student handout.
- Change to fractions or decimals, multiply, subtract, and divide.
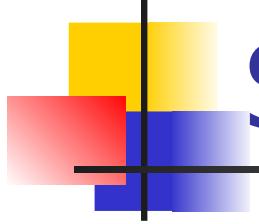
Solutions

1a) 17/20 b) 81/25,000 c) 3/8 d) 9-43/50

e) 3/625 f) 5-2/25

2a) .25 b) .4 c) .63 d) .33

3a) .22 b) .24 c) .17 d) .38
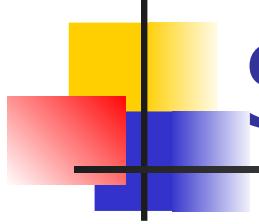
Solutions

4 a) 15.2 b) 8.28 c) 5.31 d) 34.4 e) 1.14

5 a) 63.42 b) 1,341   c) 560.7 d) 550.20

6 a) .44   b) .64   c) 2.51

7 a) 9.6   b) 38   c) .7   d) 6.9
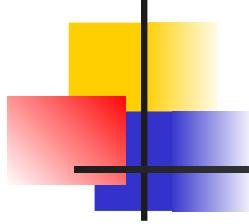
Mathematics Review

- Questions
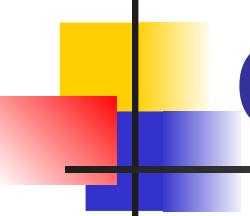
Order of Operations

- To evaluate an expression means to find a single value for it.

- If you are asked to evaluate 8 + 2 x 3, would your answer be 30 or 14?

- Since an expression has a unique value, a

- The value of 8 + 2 x 3 is 14 because multiplication is done before addition.

- To change the expression so that the value is thirty, write (8+2)x3.

- Now the operation within the parenthesis must be done first.

- Sometimes you are given the value of a variable.

- You can evaluate the expression by
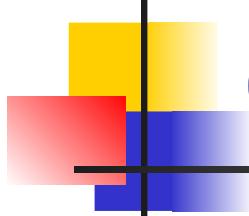
Order of Operations

- Here are some examples:

  1. 12 - 2 x 5 = 2
  2. 9(12 + 8) = 180
  3. $\dfrac{3 + 6}{1 + 2}$ = 3
  4. If r=6 then
     r(r -2) = 24
  5. If p=4 and q=2

- Try the practice problems in your handout.
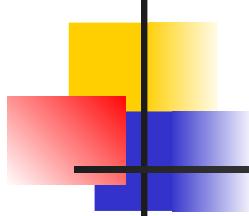
Mathematics Review

1a) 11 b) 15   c) 10   d) 52

2a) 4   b) 4   c) 5   d) 2

3a) 16 b) 16   c) 21   d) 18

4a) 43 b) 70   c) 27   d) 27

5a) 42 b) 90   c) 90   d) 34

6a) 6   b) 6   c) 6
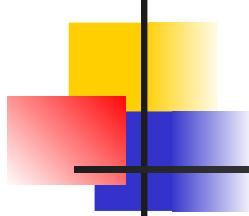
Mathematics Review

Are there any questions?
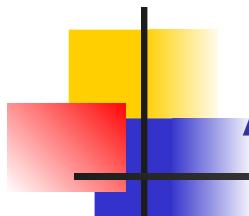
Areas and Volumes

- Area
  - To measure an area, find how much surface is taken up by a plane figure.
  - You need this to figure out how to cover a road for example.
  - Measured in square units, i.e. square yards or square
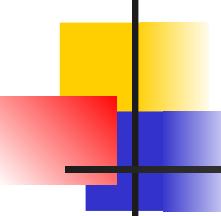
Area

- To compute the area of planes most closely associated with production estimation, use these formulas.

- When working with feet, divide by 9 to convert

- Squares and Rectangles
  - L x W = Area

- Triangles
  - $\underline{\text{W x H}}$

    2   =   Area

- Circles
 - 3.14 (r²) = Area
  - Radius = ½ diameter
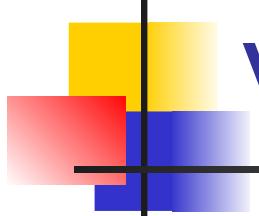
Volume

- The space occupied by a three-dimensional figure.
- The unit of measure is cubic yards (CY).
- To change, use the following

- The number 27 is a constant that will convert to cubic yards.
- There is 27 cubic feet in 1 cubic yard.
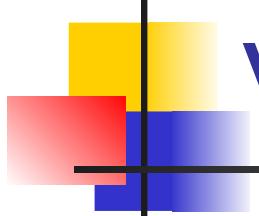
Volume

- Example: (Square or Rectangle)

$$L = 700$$

H = 10'

W = 20'

- Note: If measurements are in inches convert to

- $$\frac{700' \times 20' \times 10'}{27} =$$

  5185.19 or 5186 CY

- Note: Round up CY when
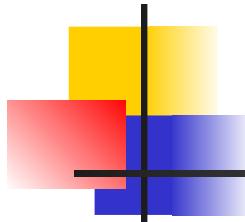
What Have You Learned

- Find the area of the following:

- A.

15'

25'

- B.

20'

20'

C.

12'
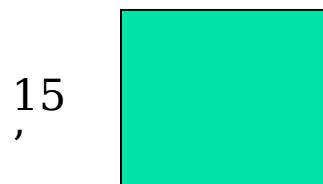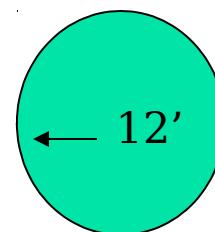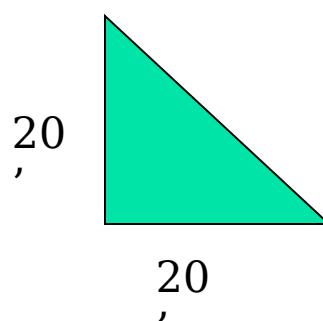
- A. 375 Sq. Ft.
- B. 200 Sq. Ft.
- C. 452.16 Sq. Ft.
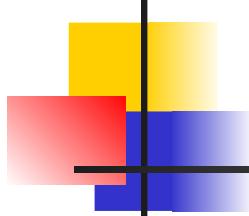
Practice Problems

- Trench #1
  - 600' long
  - 70' wide
  - 25' deep
- Trench #2
  - 350' long
  - 22' wide
  - 12' 8" deep

- $\dfrac{600' \times 70' \times 25'}{27}$ =
- 38,888.89 or 38,889 CY

- 8 ÷ 12 = .67
- $\dfrac{350' \times 22' \times 12.67'}{27}$ =
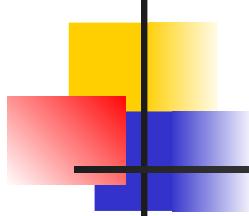
Mathematics Review

Are there any questions?
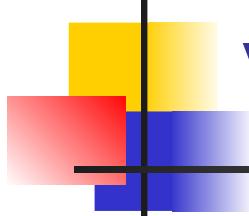
Volume of a berm

- The volume of a berm can be calculated with the use of two formulas.

The formula to calculate the cubic yards of a cone.

$\underline{3.14 \ (r^2) \ H}$ $\underline{CUBIC \ FEET}$

3   =   27   =   (CY)

note: Radius = ½ the width of the berm.

The formula to calculate the cubic yards of a prism.

To determine the length subtract the cone from the length of the berm.

$\underline{W \ x \ H}$ $\underline{A \ x \ L}$
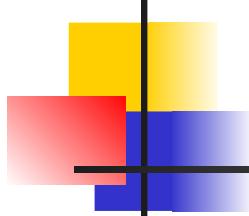
Example

- Determine the cubic yards of a berm with the following dimensions:

- (Step 1) Measure: The length, width, and height in feet.

H=25′

W=50′

L=400′
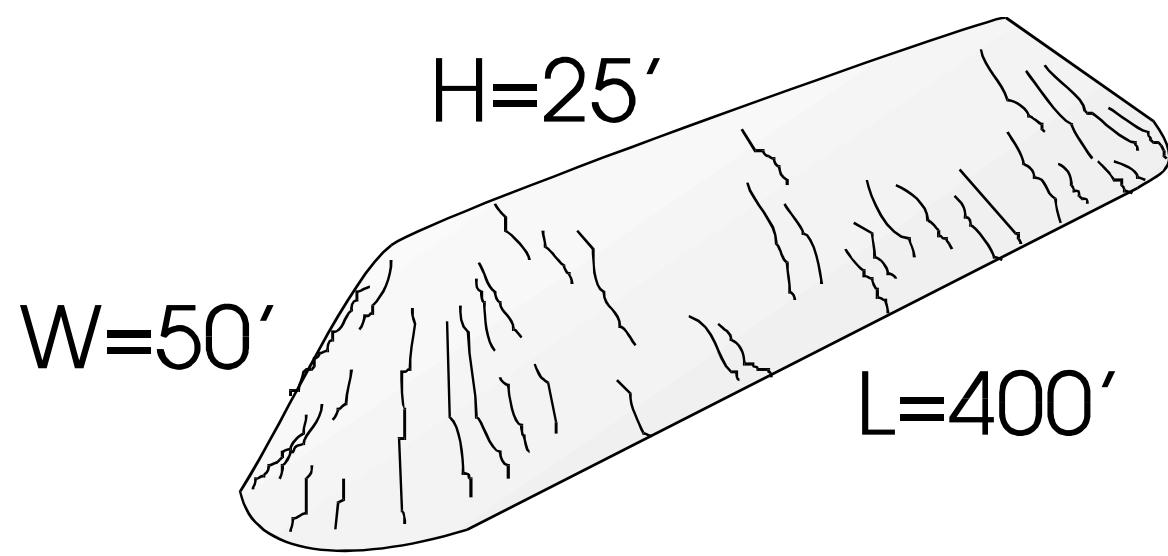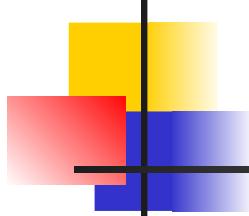
Dissect the Berm

- (Step 2) Length Of Prism: Mathematically dissect the berm into three portions.

- This is done by cutting half of the berm off of each end, thu̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ ̲ half cones.

- After cutting ̲ ̲ ̲ ̲ is the length ̲ ̲

25'

50'

350'
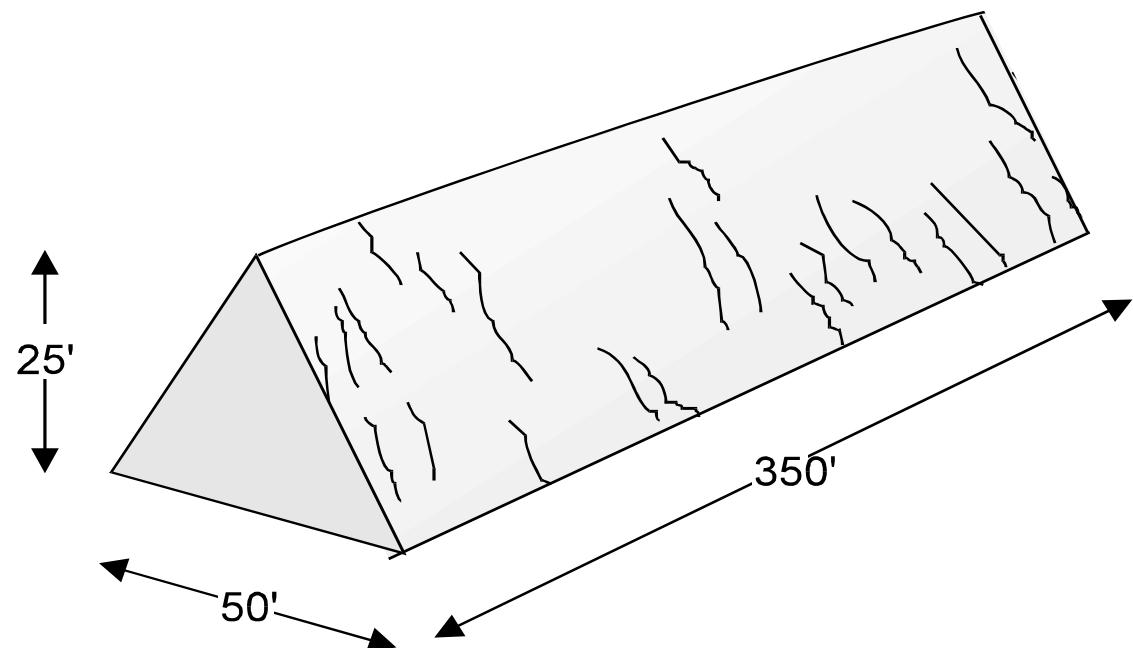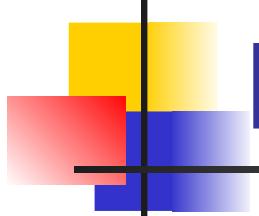
Make a Cone

- (Step 3) Radius Of Cone: Take the two half cones and put them together to make a mathematical cone.

- Remember that half the width of the berm will always be the radius of the cone.

- For example, the width of this berm is 50', this means the radius of this cone is 25'

HALF CONE + HALF CONE
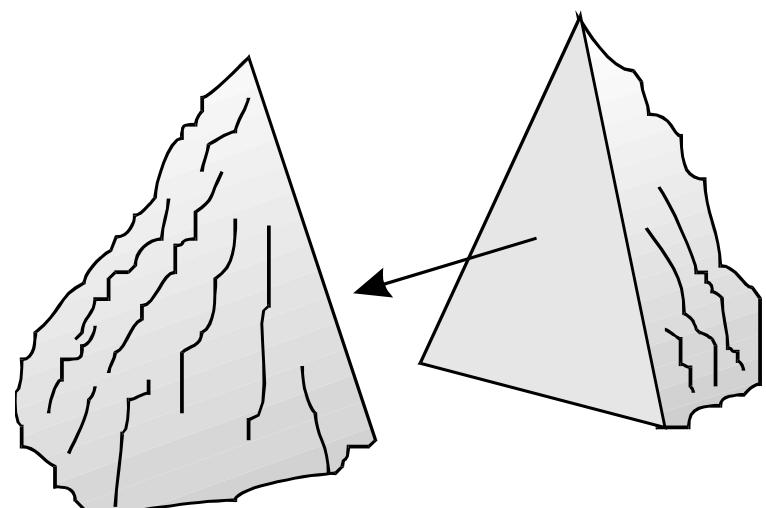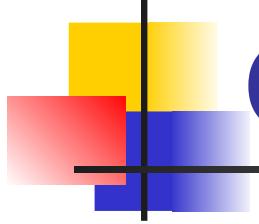
Calculate the Cone

- (Step 4) Formulate The Cone:

$$\frac{3.14 \ (25\ ^2) \ 30' \ H}{3} \ = \ \underline{19,625 \ Cone \ Cf}$$

27   = 726.85 CONE CY

- Note: Do not round off amount of material until the cone and prism are added together.
- Note: Radius = ½ width of berm, and in this formula the radius is squared.
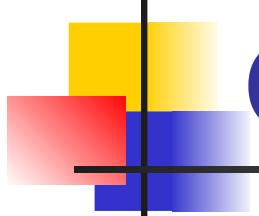
Calculate the Prism

- (Step 5) Formulate The Prism:
  - <u>50' W x 30' H</u>

    $$\frac{2}{27} = \frac{750' \text{ A x } 350' \text{ L}}{= 9,722.22 \text{ Prism CY}}$$

 - Note: do not round off amount of material until the cone and prism are added together.
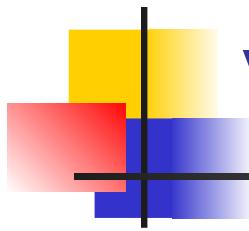
Volume of the Berm

- (Step 6) Add Cone To Prism:

  726.85 CY + 9,722.22 CY = 10,449 or 10,450 CY

 Cone   +   Prism   =   Berm

  - Note: Round up to the next full Cubic Yard when removing soil.
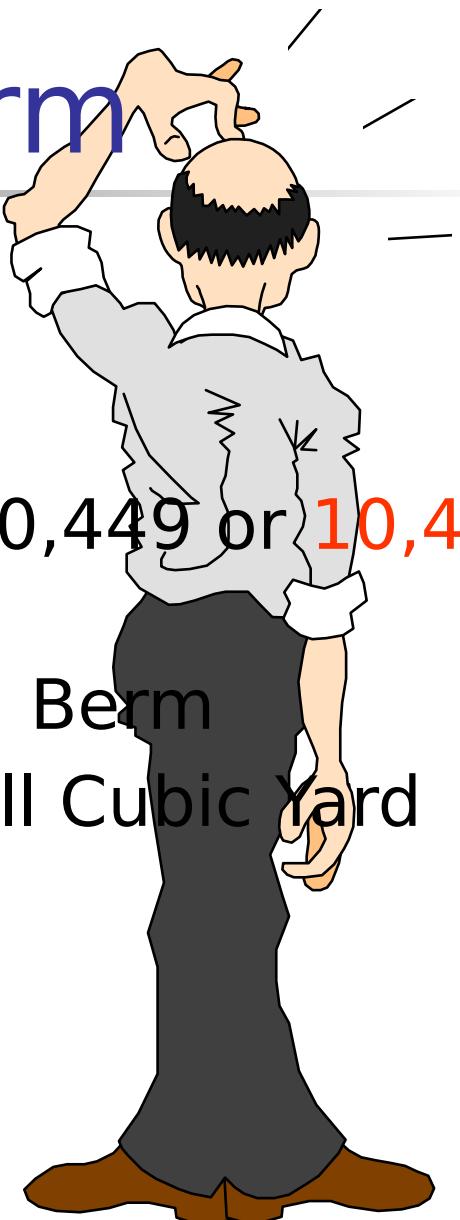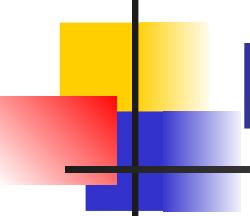
Practice Problem

- What Have You Learned?
- Problem #2
  - You have been assigned to remove a berm. What is the total cubic yards of soil to be removed?
- Berm Dimensions:
  - 650' Long
  - 61' Wide
  - 40' High
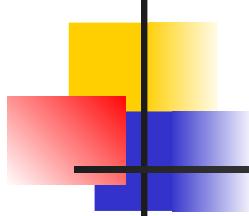
Solution

- Cone:

$$\underline{3.14 \times (30.5^2) \times 40} \qquad \underline{38,946.47 \text{ cf}}$$
$$3 \qquad = \qquad 27 \qquad = \quad 1,442.46$$

CY

- Prism:

$$\underline{61 \times 40}$$
$$2 \qquad = \quad \underline{1,220 \times 589}$$
$$27 \qquad = \quad 26,614.07 \text{ CY}$$

- Total Berm:

$$1,442.46 + 26,614.07 = 28,056.53 =$$
28,057 CY
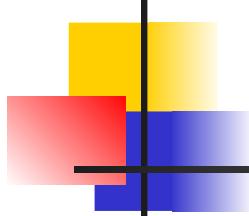
Mathematics Review

Are there any questions?
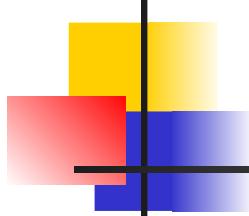
Mathematics Review

- Summary

- Take a break!